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Phase 1 GSE Support Thread Assessment

April 09, 1997

Version 1.1

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Phase 1 GSE Support Thread

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1. Introduction

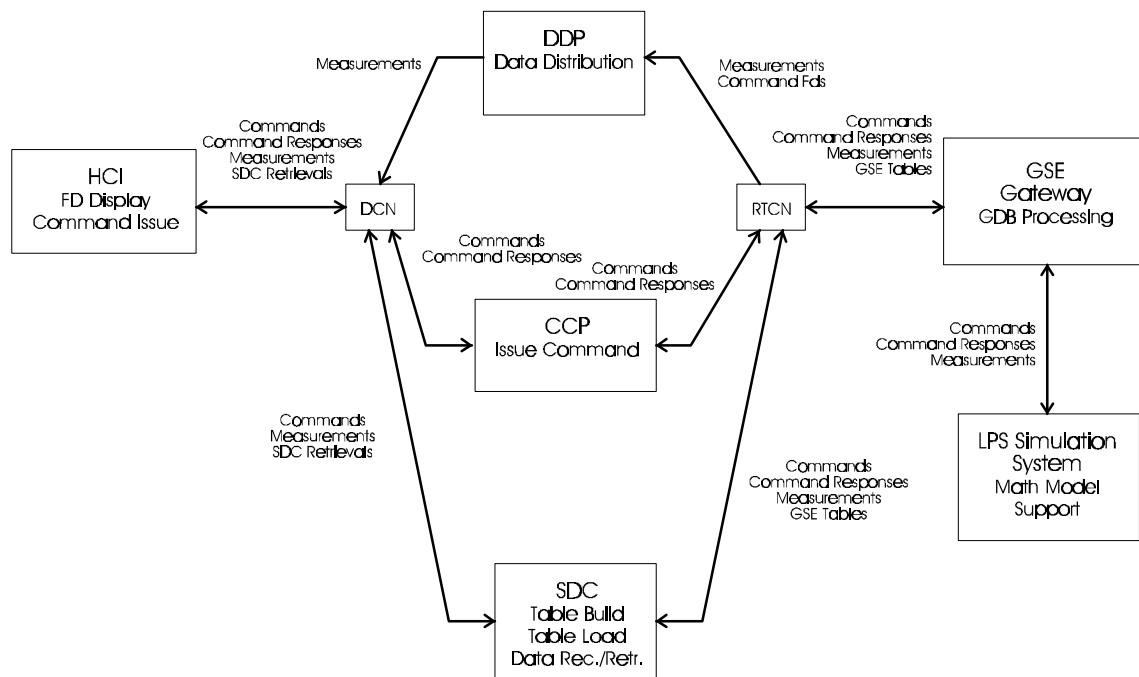
1.1 Phase 1 GSE Support Thread Overview.

The GSE Support Thread establishes the initial capability to monitor and stimulate CCMS format GSE link FD's. Recording, Retrieval, Databank, application services, display services, Data Distribution, System Build services and Test Build services will support basic CCMS format GSE FD's.

1.2 Phase 1 GSE Support Thread Concept

To provide Phase 1 GSE Support as defined in the Redstone Delivery Document Section 4.2 requires support from all major CLCS Systems. The following concept diagram illustrates primary data flows between each system for the thread.

GSE Thread Concept Diagram



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The following CSCIs and HWCI are required by the Phase 1 GSE Support Thread:

Number	CSCI/HWCI Name	CSCI/HWCI
1	GSE Services	CSCI
2	GDB/LDB Interface Board	HWCI
3	VTP	HWCI
4	GCP Common Services	CSCI
5	DDP/CCP Emulator (Test Tool)	CSCI
6	Test Build	CSCI
7	System Control	CSCI
8	Command Processor	CSCI
9	Data Distribution	CSCI
10	System Services	CSCI
11	Application Services	CSCI
12	System Viewer	CSCI
13	Data Recording/Archival and Retrieval	CSCI
14	Other - Identify all required GSE FDs for Redstone	N/A

- Software developed originally for the GSE Gateway for the DE Single String Project will be modified and enhanced to support CLCS requirements and will comprise the GSE Services CSCI. Multiple GDB support within a single GSE Gateway will also be investigated.
- The CORE developed GDB Interface Board will be used to provide the data path between the GDB and the GSE Gateway VME Bus (GDB/LDB Interface Board HWCI).
- The VME Telemetry Processor that will be used in all Gateways will be developed (VTP HWCI).
- The Redstone class Gateway Control Processor (GCP) Services CSCI that will be used in all Gateways will be developed.
- GSE Gateway Tables will be defined and the process to generate the tables will be developed (Test Build and Control CSCI).
- A test tool will be developed to simulate data transfers between the GSE Gateway and the DDP/CCP (DDP/CCP Emulator).
- A process to load the GSE Tables will be developed as part of the System Control CSCI (Test Load).
- The Command Processor CSCI will be developed to generate and transmit commands to the GSE Gateway (Issue Commands CSCI).
- The Data Distribution CSCI will be developed with the capability to process measurements from the GSE Gateway.
- The System Services CSCI will be enhanced to support reliable message transmission in the VxWorks and UNIX environments (Network Services CSCI).
- The System Viewer CSCI will be developed with the capability to display GSE FD's (FD Viewer CSCI).
- The Data Recording and Retrieval CSCI will be developed to record and retrieve GSE FDs from SDC.
- The existing Data Bank will be queried to determine the GSE measurement FDs for Redstone that will be supported.

1.3 Phase 1 GSE Support Thread Specification

The specifications for the Phase 1 GSE Support Thread were derived directly from the Statement of Work:

- Provide a GSE Gateway capable of polling a CCMS format GSE bus and providing Change Data Packets via the RTCN at the system synchronous rate (5-50msec).
- Provide the capability to detect GSE Bus and HIM Errors and update the FD Status appropriately.

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- Provide the Test Build Services capable of supporting the initial GSE FD's, including GSE Gateway Table Generation and On-Line Databank Generation.
- Provide the capability to load/reload the GSE Gateway Tables in the Gateway.
- Provide the initial capability to record and retrieve the Initial GSE FD's via SDC.
- Provide the application services required to support display of the Initial GSE FD's.
- Provide the capability to issue basic Analog and Discrete stimulus on the CCMS format GSE link via a GSE Gateway.
- Define and support the GSE measurement FD's (AM, AS, DM, DS, DPM) for Redstone

1.4 Phase 1 GSE Support Thread Assessment Summary

The total labor required to provide the capabilities defined in the Phase 1 GSE Support Statement of work are summarized in the Table Below:

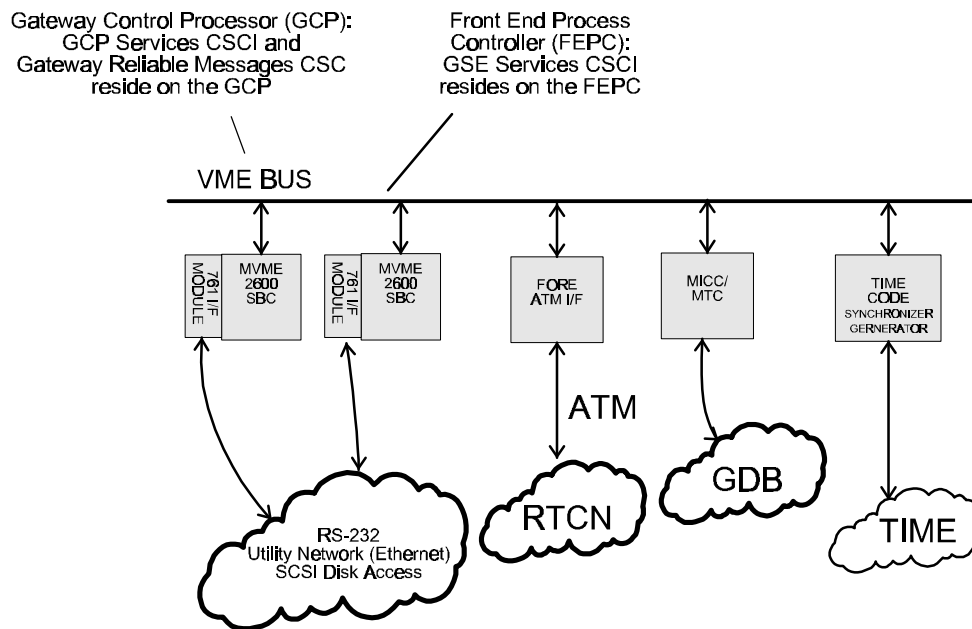
Number	CSCI/HWCI Name	Labor Required for Redstone (Labor months)(If assessed in another thread, then thread name)
1	GSE Services	9
2	GDB/LDB Interface Board	0
3	VTP and Rack	2
4	GCP Common Services	8.5
5	DDP/CCP Emulator	2
6	Test Build & Control	Test Build, Load & Activation
7	System Control	System Build Phase 1
8	Command Processor	User Commanding Phase 1
9	Data Distribution	Data Distribution
10	System Services	Reliable Messages Phase 2
11	Application Services	User Display Monitoring/Plotting
12	System Viewer	User Display Monitoring/Plotting
13	Data Recording/Archival and Retrieval	Data Distribution
14	Other - Identify all required GSE FDs for Redstone	.25
Total :		21.75

A total eight Gateway VME Telemetry Processors will be procured to support the Reliable Messages Thread. The cost of this procurement is expected to be approximately \$160,000. A cost break down for this procurement is included in Section 1.12

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1.5 Phase 1 GSE Support Thread Hardware Diagrams

GSE Gateway VTP



Notes:

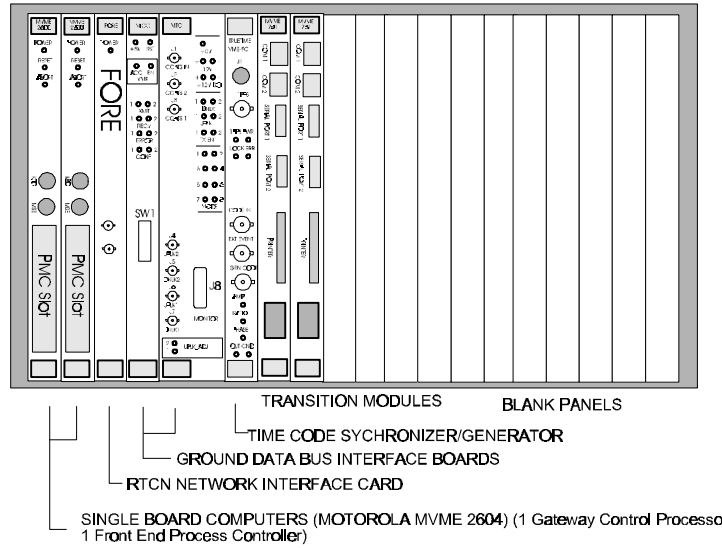
All processor board's
console ports will be connected
to a comm server (not shown)

SCSI Disk Not Shown

GCP: Gateway Control Processor
FEPC: Front End Process Controller

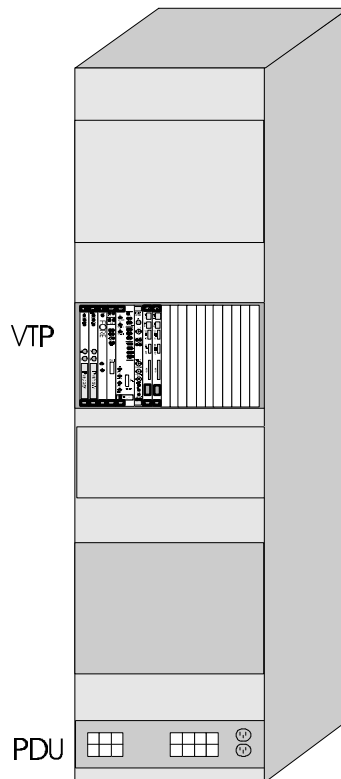
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GSE Gateway VME Telemetry Processor (VTP)



GSE Gateway Rack

GSE GATEWAY RACK CONFIGURATION



1.6 Phase 1 GSE Support Thread Deliverables

- GSE Services CSCI
 - Design Specifications and Requirements

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- Software: Source, Executables, Libraries
- UIT Procedures
- GCP Common Services CSCI
 - Design Specifications and Requirements
 - Software: Source, Executables, Libraries
 - UIT Procedures
- Gateway Hardware (See table in section 1.4)
- Demonstration of Thread Capability Procedures

1.7 Phase 1 GSE Support Thread Schedule

See Attached Schedule

1.8 Phase 1 GSE Support Thread Simulation Requirements

The Phase 1 GSE Support Thread will utilize the existing LPS Simulation System with the math models for HMF and OPF GSE. The GSE Gateway will be connected to the VSIs in the LCC via the PCC RCVS. All simulations will be conducted in the real-time mode.

In addition to model support, a mini-HIM will be used to verify command and measurement processing interfaces. The mini-HIM will be available in the SDEs for testing.

1.9 Phase 1 GSE Support Thread System Test Requirements

Phase 1 GSE Support Thread Capability will be tested in the PCC SDEs. It will involve an end to end test requiring support from the LPS Simulation System operating in the real-time mode (includes VSI support). All capabilities in the thread will be evaluated by CLCS Integration and Test Personnel. A detailed test plan will be drafted. A table of the capabilities that will be tested is shown below:

Number	CSCI/HWCI Name	Capability
1	GSE Services	GDB Processing/Him Error Detection
2	GDB/LDB Interface Board	GDB VME Interface
3	VTP and Rack	Data Processing
4	GCP Services	RTCN Support, Table Load
5	DDP/CCP Emulator	DDP/CCP Emulation
6	Test Build & Control	GSE Table Generation
7	System Control	GSE Table Load
8	Command Processor	Command Issue
9	Data Distribution	Change Data Distribution
10	System Services	System Advisory and Message Writer for Gateways
11	Application Services	FD Services
12	System Viewer	FD Display
13	Data Recording/Archival and Retrieval	FD Recording and Retrieval

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1.10 Phase 1 GSE Support Thread Training Requirements

- Redstone System Integrators will be trained to test the Phase 1 GSE Support Thread. Training will be provided by the Subsystem Engineering and CSCI Leads.
- MVME 2600 Training (Single Board Computer planned for use VTP) will provided by Motorola.

1.11 Phase 1 GSE Support Thread Facilities Requirements

The Phase 1 GSE Support Thread requires GSE Cables to run from the RCVS on the 3rd floor of the PCC to the SDE Gateway Racks and to the Gateway Lab area.

1.12 Phase 1 GSE Support Thread Procurement

The Gateway VME Telemetry Processors will be procured for Redstone. A summary of the procurement schedule is shown below:

Procurement Activity	Completion Date
Define VTP Requirements	4/30/97
Submit Purchase Request to Procurement	5/9/97
Award Contract	6/9/97
Receive VTPs	7/9/97

The total Hardware Costs required to provide this capability is summarized in the following table;

Item number	Name	Unit Cost	Qty.	Total	Assumptions
1	VTP	\$20,000	8	\$160,000	New Buy
2	Rack	\$5,000	5	\$0	On-hand - CORE Residuals
3	GDB I/F Board	\$3,000	6	\$0	On-hand - CORE Residuals
4	DDP			\$0	Assume on-hand (SDE 1 & 2)
5	CCP			\$0	Assume on-hand (SDE 1 & 2)
6	HCIs			\$0	Assume on-hand (SDE 1 & 2)
7	RTCN Cable Plant			\$0	Assume on-hand (SDE 1 & 2)
8	Facility Mods			\$0	Assume on-hand (SDE 1 & 2)
9	Run GSE Cables to PCC 3 rd Floor RCVS			\$0	Level of Effort
10	Deltas to SDC Hardware			\$0	Level of Effort (This may not be a good assumption)
		Total:		\$160,000	

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1.13 Phase 1 GSE Support Thread Dependencies

The following CSCIs will support requirements for Phase 1 GSE Support Thread. CSCI requirements are addressed in assessments for threads listed in the table below.

CSCI	CSC(s) (If known)	Thread
Test Build & Control	GSE Tables, On-line Data Bank Build	Test Build, Load & Activation
System Control	Table or "Test" Load	System Build Phase 1
Command Processor	Issue Commands	User Commanding Phase 1
Data Distribution	Time Reordering, Data Distribution, Data Health	Data Distribution
System Services	System Advisory and Message Writer, User Display Services	Reliable Messages Phase 2
Application Services	FD Services, On-line Data Bank	User Display Monitoring/Plotting
System Viewer	FD Viewer	User Display Monitoring/Plotting
Data Recording/Archival and Retrieval		Data Distribution

1.14 Phase 1 GSE Support Thread Action Items/Resolution

- The Redstone RTCN Packet Payload format must be defined as soon as possible. The new payload format must address command, measurement and system message syntax.
- For Redstone, the GDB Interface board will communicate directly with the CCMS I RCVS (No special V&DA).
- Are Commands and Command Responses required to be Recorded for Redstone ?
- Limited Command Authorization will be supported in the Command Processor (CCP) and Gateway
- Racks and Comm Servers are not included in the Assessment (existing equipment).
- Required Systems Messages for Redstone must be defined.
- If a HIM error is detected, the appropriate FD status bit in the packet payload will be set.
- A utility network (Ethernet - 10Base2 or 10BaseT) must be available in all facilities planned for Redstone Gateway Deployments:
 - PCC SDE 1 and SDE 2
 - PCC Gateway Lab
 - HMF
- Limited Gateway control will be supported for Redstone (initialization, table load, activate data acquisition, inhibit data acquisition).
- The Gateway team will write the Gateway System Advisory and Message Writer as part of the GCP Services CSCI
- Type II HIM Support will not be included in the Redstone Release.
- Labor Estimates - how the project counts LOC must be defined.

2. CI Assessments

2.1 GSE Services CSCI Assessment

All the activities described in this section refer to CSCs that reside on the GSE Gateway Front End Process Controller.

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GSE Gateway Initialization

No additional work required.

GSE Gateway Table Load and Initialization

The Redstone delivery defines the initial capability provided by this CSCI. FEPC table load and initialize capability will be added.

GSE Gateway Measurement Data Processing

Add engineering unit conversions.
Update change data packet formats.

GSE Gateway Command Processor

Add FEPC table load command processing
Update command packet formats

GSE Gateway Issue Command

No additional work required.

GSE Gateway Refresh

No additional work required.

GSE Gateway Table Maintenance

Not required for Redstone Delivery.

GSE Gateway Redundancy Management

Not required for Redstone Delivery.

GSE Gateway Fuel Cell Simulation

Not required for Redstone Delivery.

GSE Gateway HIM Hardware Test

Not required for Redstone Delivery.

GSE Front End Process Controller (FEPC) VxWorks Kernel

The VxWorks Power PC Kernel version 5.3 will be utilized. Modifications to sysLib.c will be made to configure the board for the Gateway.

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CSCI Assessment

Function Name	CSCI Labor (EP (labor months))	% of CSCI completed for Redstone	Function EP (column 2x3)
GSE Gateway Initialization	1.2	.50	.6
GSE Gateway Table Load and Initialization	1.2	.50	.6
GSE Gateway Measurement Data Processing	3	.90	2.7
GSE Gateway Command Processor	3	.75	2.25
GSE Gateway Issue Command	1.2	.95	1.14
GSE Gateway Refresh	1.2	.50	.6
GSE Gateway Table Maintenance	3	0	0
GSE Gateway Redundancy Management	3	0	0
GSE Gateway Fuel Cell Simulation	1.2	0	0
GSE Gateway HIM Hardware Test	1.2	0	0
GSE FEPC VxWorks Kernel	1.2	.95	1.14
		Total	9.03

Lines of Code

Approximately 1000 LOC will be required to implement the table load and initialize functionality.
Approximately 150 LOC will be changed/added to update data and command packet formats.
Less than 100 LOC will be required to add engineering unit conversions.

Documentation

None

Assumptions

The labor identified in this assessment is for modification of existing GSE software to add the additional capability defined by the Redstone delivery.

This assessment is for code residing on the FEPC component of the gateway. The GCP will be assessed separately.

The gateway software will be loaded using normal VxWorks techniques (i.e. CPU console port interactions)

Open Issues

The mechanisms for loading tables need to be defined; source → GCP, GCP → FEPC

2.2 Gateway Control Processor (GCP) Services CSCI Assessment

The Gateway Control Processor Services CSCI will be revised in order to comply with the other CLCS subsystems available at the Redstone Release. The Juno Release was derived from the Test, Control, and Monitor System (TCMS) and did not interface with other CLCS subsystems. The Real-Time Operating System (RTOS) and the hardware platform will be upgraded. Changed data, Commands, and table loads will be supported using the RTCN.

Gateway Initialization/Re-initialization CSC

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System Initialization will not undergo any major changes.

Gateway Command Processor CSC

The routing code in the C-to-C will be used to route the packet (based on priority) to the appropriate processor in the gateway.

Gateway Table Load, Initialization, and Maintenance CSC

Table loading from the SDC or CCP will be supported. Table Maintenance will not be supported for Redstone.

Gateway RTCN Utilities CSC

This CSC provides the capability to accept commands, load tables, and transmit changed data from the RTCN. This CSC includes function that will generate changed data packets via the RTCN at the system synchronous rate (5-50 mSec) and will process commands received from the RTCN.

Gateway Timer Services CSC

Timer utilities are being modified and enhanced in order to provide all the utilities needed by GCP and FEPC in the gateway. Timer utilities provide the capability to retrieve time accurate to a micro second. The utilities also provide for the creation of very accurate event timers.

Gateway Overall Health & Status CSC

H&S will be further defined in order to support all the CLCS gateways.

Gateway Utility Request CSC

Error logging services will support both processors in the gateway. These services will also be made more time efficient. Memory dumps and other services will be available in a later release. This CSC will provide System Advisory and Message Writing Capability.

Gateway Maintenance User Interface CSC

Maintenance User Interface will not undergo any major changes.

Gateway Software Diagnostics CSC

Later release.

Gateway Redundancy Management CSC

Later release.

Gateway Common Processor (GCP) VxWorks Kernal CSC

The VxWorks Power PC Kernal version 5.3 will be utilized. Modifications to sysLib.c will be made to configure the board for the Gateway.

CSCI Assessment

Function Name	CSCI Labor (EP (labor months))	% of CSCI completed for Redstone	Function EP (column 2x3)
Gateway Initialization/Re-initialization CSC	7.5	.067	.5
Gateway Command Processor CSC	5	.300	1.5

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Function Name	CSCI Labor (EP (labor months))	% of CSCI completed for Redstone	Function EP (column 2x3)
Gateway Table Load, Initialization, and Maintenance CSC	5	.300	1.5
Gateway RTCN Utilities CSC	10	.250	2.5
Gateway Timer Services CSC	2.5	.200	.5
Gateway Overall Health & Status CSC	10	.050	.5
Gateway Utility Requests CSC	5	.100	.5
Gateway Maintenance User Interface CSC	10	.050	.5
Gateway Software Diagnostics CSC	10	0	0
Gateway Redundancy Management CSC	20	0	0
GCP VxWorks Kernal CSC	1	.500	.5
		Total	8.5

Lines of Code

It is estimated that 1800 LOC are involved in developing these Redstone capabilities. Currently it is estimated that the Gateway Control Processor System Manager CSCI will require a total of 20,000 LOC. Approximately 4,500 LOC will be re-used from previous Gateway development activities.

Documentation

GSE Gateway Operations Procedure will be developed.

Assumptions

Assumption 1: Tables are not re-loaded while the gateway is in Data Acquisition and Control (DAC).

Open Issues

- Issue 1: Will the capability to re-initialize the gateway be required in Redstone ? Yes
- Issue 2: Will Activate/Inhibit Data Acquisition be required in Redstone ? Yes
- Issue 3: Will Load Table be commanded to the gateway or will the gateway fetch its own tables ? Will be worked for Requirements Design Panel
- Issue 4: Will the RTCN packet rate change be executed via a command (RTCN) ? No
- Issue 5: Will there be a command to transmit Overall H&S onto the RTCN ? Not for Redstone
- Issue 6: Will the gateway need to provide a periodic H&S packet ? Yes
- Issue 7: Will the gateway need to respond to an on-demand poll for H&S ? No
- Issue 8: Will the gateway provide all the necessary H&S via status FDs ? No

2.3 CCP/DDP Emulator CSCI Assessment

The DDP/CCP Emulator CSCI will provide the capability to test the RTCN Interface between the CCP, DDP, and the Gateway.

DDP/CCP Emulator CSCI CSCs

TBD

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CSCI Assessment

Function Name	CSCI Labor (EP - labor months)	% of CSCI	Function EP
DDP/CCP Emulator CSC	2	1.00	2

Lines of Code

TBD.

Documentation

DDP/CCP Emulator Operations Procedure will be developed.

Assumptions

No Assumptions

Open Issues

None

2.4 GDB Interface Board HWCI Assessment

GSE Support Phase 1 Thread Hardware Link Board HWCI

The hardware link board provides the physical interface between the GSE Gateway and the dual simplex GSE data bus. It allows the GSE Gateway FEPC to transmit command data on the GSE data bus primary and secondary uplink transmission lines and receive response data from the GSE data bus primary and secondary downlink transmission lines.

Work Required

The existing MICC/MTC hardware link board sets designed for the CORE project will be used to support this thread. GDB interface requirements will be reviewed to verify the suitability of the MICC/MTC board for use in the GSE Gateway.

HWCI Assessment

No additional capability is required for the GSE Support Phase 1 Thread.

Equipment

Equipment Type	Quantity	Unit Cost Estimate	Total Cost
MICC/MTC Board Set	8	\$ 0	\$ 0
Total			\$ 0

Documentation

Existing MICC and MTC IDMMs will provide sufficient documentation for the GSE Support Phase 1 Thread.

Assumptions

This HWCI assessment is based on the assumption that the existing MICC/MTC board set can support required operations for the GSE Support Phase 1 Thread without modification.

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Open Issues

1. The existing MICC/MTC board set may not be able to support all GSE Gateways without modification.
2. The existing engineering for the MICC/MTC is not in an acceptable format for long term maintenance.
3. It is desirable to use the same hardware link board for both the GSE Gateways and the LDB Gateways. Evaluation of the MICC/MTC board set's ability to support the LDB Gateway has not yet been completed. Also, alternate solutions to the hardware link for the LDB are currently being evaluated. Based on these ongoing evaluations, an alternate solution to the MICC/MTC board set may be considered.

2.5 VME Telemetry Processor HWCi Assessment

The Gateway VME Telemetry Processor contains the telemetry processing hardware that is common to all CLCS Gateways. The hardware platform chosen for the VTP is based on the VME Standard. The VME standard provides a common high speed parallel bus network for Single Board Computers and a variety of special purpose boards such as telemetry processing boards. Software developed for all Gateways will operate on high speed RISC based single board computers. For Redstone, network communication with the RTCN will be provided with a single ATM board. Accurate system time will be provided via an IRIG-B Time Code Generator/Synchronizer VME Board. The VTP will also contain at least one SCSI disk drive.

Work Required

Define VTP requirements
Development purchase request
Award contract
Test new hardware

It is estimated that approximately 2 labor months are required to perform these activities.

HWCi Assessment

Equipment: VME Telemetry Processor

Equipment Type	Quantity	Unit Cost Estimate	Total Cost
VME Chassis	1	\$5,000	\$5,000
Single Board Computer	2	\$5,500	\$11,000
IRIG B Board	1	\$1,000	\$1,000
ATM Board and Driver	1	\$2,000	\$2,000
SCSI Disk Drive	1	\$1,000	\$1,000
Total			\$20,000

Total Cost for Redstone:

Location	Quantity	Total Cost
PCC Gateway Lab	2	\$40,000
PCC SDE 1	1	\$20,000
PCC SDE 2	1	\$20,000
HMF	4	\$80,000
Total		\$160,000

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Documentation

Documentation for the Single Board Computers and the ATM Board is required. OEM user's guides are sufficient.

Assumptions

There are no assumptions.

Open Issues

There are no open issues.

3. COTS Products Dependencies

3.1 SW Products Dependency List

VxWorks 5.3 Update that includes IP multicast support.

3.2 HW Products Dependency List

VME Telemetry Processor Procurement

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4. Assessment Status

CI Assessment Assignments

CI Name	Function	Group	Responsible Person
GSE Services	GSE FEPC Software	Gateway	Mike Lunceford
GCP Services	GSE GCP Software	Gateway	Jose Marin
GDB I/F Board	GDB Hardware I/F	Gateway	Scott Cummins
VTP	Gateway HW Platform	Gateway	Shawn Quinn

4.1 CI Assessment Status

CI Name/Function	Person Providing Status	Date	Status
GSE Services	Mike Lunceford	3/10/97	In Work
GCP Services	Jose Marin	3/10/97	In Work
GDB I/F Board	Scott Cummins	3/10/97	In Work
VTP	Shawn Quinn	3/10/97	In Work